



Weed shifts in herbicide-resistant canola systems

CATEGORY [weeds](#) | July 11, 2024

Since the introduction of herbicide-resistant canola systems, difficult-to-control species such as cleavers, volunteer canola, green foxtail, and foxtail barley have increased in abundance. Green foxtail was associated with glyphosate-resistant systems. Wild oat was predominant in longer canola rotations with glufosinate and imidazolinone-resistant canola.

Herbicide-resistant (HR) canola varieties were first commercialized in 1997 and had almost replaced conventional varieties in the 15 years after introduction. Their primary advantages were improved weed control and post-emergent application compared to trifluralin- and ethalfluralin-based production systems that required soil incorporation.

The two most popular HR systems are genetically modified Roundup Ready (glyphosate-tolerant) and Liberty Link (glufosinate-tolerant). Clearfield canola is a third system and minor player, based on resistance to imazamox and imazethapyr. Clearfield canola was developed using mutagenesis and is not classified as genetically modified in Canada.

The main objective of this study was to determine changes in weed community composition and diversity due to the adoption of different HR canola systems and canola frequency in crop rotation. Analysis of long-term data from weed surveys was used to assess changes in weed community

composition and species diversity, Prairie Weed Survey data was analyzed from surveys conducted from the 1970s to 2014. All weed surveys followed the same survey protocol, and data was collected after in-crop weed control in July or August. Data was compared for the years before and after 1995 when HR varieties were introduced.

A canola field experiment was included in the analysis to document any short-term changes in the weed community. It was conducted from 2008-2012 at Agriculture and Agri-Food Canada at Lethbridge and Lacombe, AB, and led by Neil Harker (retired). The treatments included glufosinate- and glyphosate-resistant canola grown continuously or in a canola-wheat or canola-pea-barley rotation. Weed counts were conducted from 2011-2012 after one cycle of the study.

Some shifts in weeds

Wild oat, wild mustard, stinkweed, green foxtail, lambs quarters, perennial sow thistle, flixweed, red root pigweed and bluebur had significantly lower frequency after 1995, compared to before 1995. This may have been attributed to the introduction of HR canola, but also the increase in no-till and other changes such as climate, crop rotations, and time of seeding.

Russian-thistle, willowherb species, canola, shepherd's-purse, dandelion, narrowleaf hawksbeard, annual sow thistle and biennial wormwood tended to increase in abundance after 1995. Volunteer canola has increased in mean frequency by 18% and volunteer wheat by 14% after 1995. Cleavers frequency has increased since 1970 indicating that the species is difficult to control and is ecologically adaptive.

In the field study, weeds were relatively well controlled after herbicides were applied, with the exception of foxtail barley, which was not controlled in most HR systems. The Liberty link continuous canola rotation had more weeds than the two more diverse rotations, but this difference was not observed in the Round-up ready canola rotations. Green foxtail was associated with RR systems in each rotation. Wild oat was predominant in longer rotations with glufosinate and imidazolinone-resistant canola.

Volunteer canola was highly associated with rotations of either continuous canola or canola every second year but was generally well-controlled when canola was grown every third year in the field study. Shepherd's purse was highly associated with continuous canola or canola every second year in the LL system.

Overall, the weed survey and field experiment showed greater control and clear decline of most weed species after the introduction of HR canola varieties. However, since the adoption of HR

canola, difficult-to-control species such as cleavers, volunteer canola, green foxtail, and foxtail barley have increased in abundance.

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